Docket No. DWHP200001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re **PATENT** application of:

Applicant:	Donna Walker
Application No.:	10/632,231
For:	METHODS AND APPARATUS FOR STRESS RELIEF USING MULTIPLE ENERGY SOURCES
Filing Date:	July 31, 2003
Examiner:	Sikyin Ip
Art Unit:	1742

Mail Stop Amendment
Assistant Commissioner for Patents
Washington, D.C. 20231

SUPPLEMENTAL DECLARATION UNDER 37 CFR § 1.132

Dear Sir:

Donna M. Walker declares as follows:

1. I am the inventor of the subject matter of the above-identified patent application.

2. I am the declarant of my declaration under 37 CFR § 1.132 dated November 15, 2005, and the declarations contained herein are in further reference to my November 15, 2005 declaration and the testing results shown and discussed therein.

3. In the comparative testing referred to in my November 15, 2005 declaration, all specimens, including the baseline sample identified as "#1 Rolled-baseline" in the test results of Exhibit B of my November 15, 2005 declaration, were sectioned from a single

plate of cold-rolled steel. The plate had been specially rolled to a 10% reduction in order to induce a high level of residual stresses suitable for the experiments. The experiments on the plate were done to determine the Larson-Miller parameters of the rolled 4340 steel using the Walker process. Since all tensile specimens were excised from a single plate, they were produced to be as similar as possible. A tensile specimen from this plate is identified as the first steel sample in my November 15, 2005 declaration, and was used for the sequential thermal testing and vibration testing to sequentially test a heat stress relief cycle followed by a vibration stress relief cycle, with both cycles identical to those used during the Walker process with the second steel sample, but not applied simultaneously as in the Walker Process. To give the most chance of success, the longest cycles which had been used for the Walker Process testing were used in testing the first steel sample, which were 120 seconds in length. The thermal cycle for the Walker process for the second steel sample was carefully reproduced, including the faster cool-down of the specimen induced by using a small fan to cool the specimen. When this is done during the Walker process, the result is a specimen with a slight compressive stress on the surface which retards cracking which could occur due to tensile surface residual stresses, a highly desirable state. However, when the same cooling process was used for the first steel sample for the sequential testing without temporal overlap, the result is that the thermal gradient results in a rise in stress values in the final residual stress pattern. This explains why the first steel sample has higher residual stress than the baseline sample. This pattern of residual stresses due to thermal gradients is endemic to the usual cooling process used in manufacturing and is frequently the source of residual stresses in production parts. For the sequential testing of the first steel sample with the 120 second vibration processing which followed once the specimen was again at room temperature was completely insufficient alone to relieve the resulting stresses. However, when the Walker Process was used for the second steel sample, the specimens are found to be completely stress relieved in this set of conditions.

4. The attached Exhibit C shows a Larson-Miller curve for a vibration process with the vertical axis representing the percentage of residual stress remaining in the tested samples and the horizontal axis representing the Larson-Miller parameter. The parameter Pv for the Vibratory Process portion of the sequential experiment would be located at approximately P=9. This value somewhat exceeds the Pc value used for the Combined Process experiment where P=7.28.

5. The attached Exhibit D shows two Larson-Miller curves, one for a thermal process and one for a combined thermal and vibration process according to my invention, with the vertical axis representing the percentage of residual stress remaining in the tested samples and the horizontal axis representing the Larson-Miller parameter. The parameter Pt used for the thermal portion of the sequential experiment is located at approximately P=7.33. This value corresponds to the Pc value of approximately P=7.28 used for the Combined Process experiment.

6. The attached Exhibit E shows three Larson-Miller curves, one for the thermal process, one for the combined thermal and vibration process according to my invention, and the third for the vibration-only process, with the vertical axis representing the percentage of residual stress remaining in the tested samples and the horizontal axis representing the Larson-Miller parameter. Using the method proposed in the patent of subtracting the Larson-Miller parameter values of Method 1 from the Larson-Miler parameter values of Method 2 to obtain the approximate values of the Larson-Miller curve for the combined process yields a reasonable result. At the maximum level of stress relief, the Thermal Process Larson-Miller curve value is approximately P=17, and subtracting a Larson-Miller curve value for the Vibratory Process of approximately P=11, a final suggested Larson-Miller parameter of approximately 6 is obtained. The results obtained during our construction of the Larson-Miller parameter curve for the Combined Process for stress relief indicates that this parameter does obtain the desired result of nearly complete stress relief. At the temperature used for the Combined Process, this resulted in an

experimental time of 10 seconds. The sequential experiment was run at 120 seconds for each independent process sequentially.

7. This declaration is submitted prior to final rejection.

DECLARATION

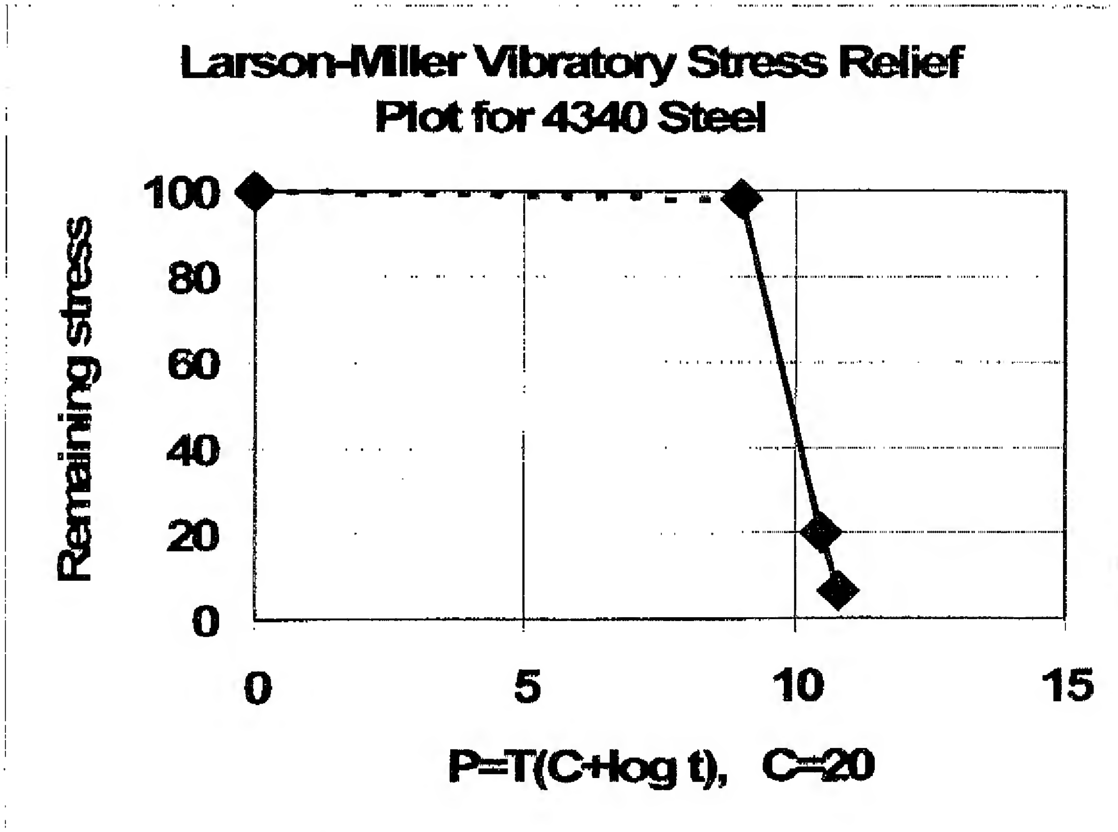
8. As a person signing below, I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE

9. INVENTOR:

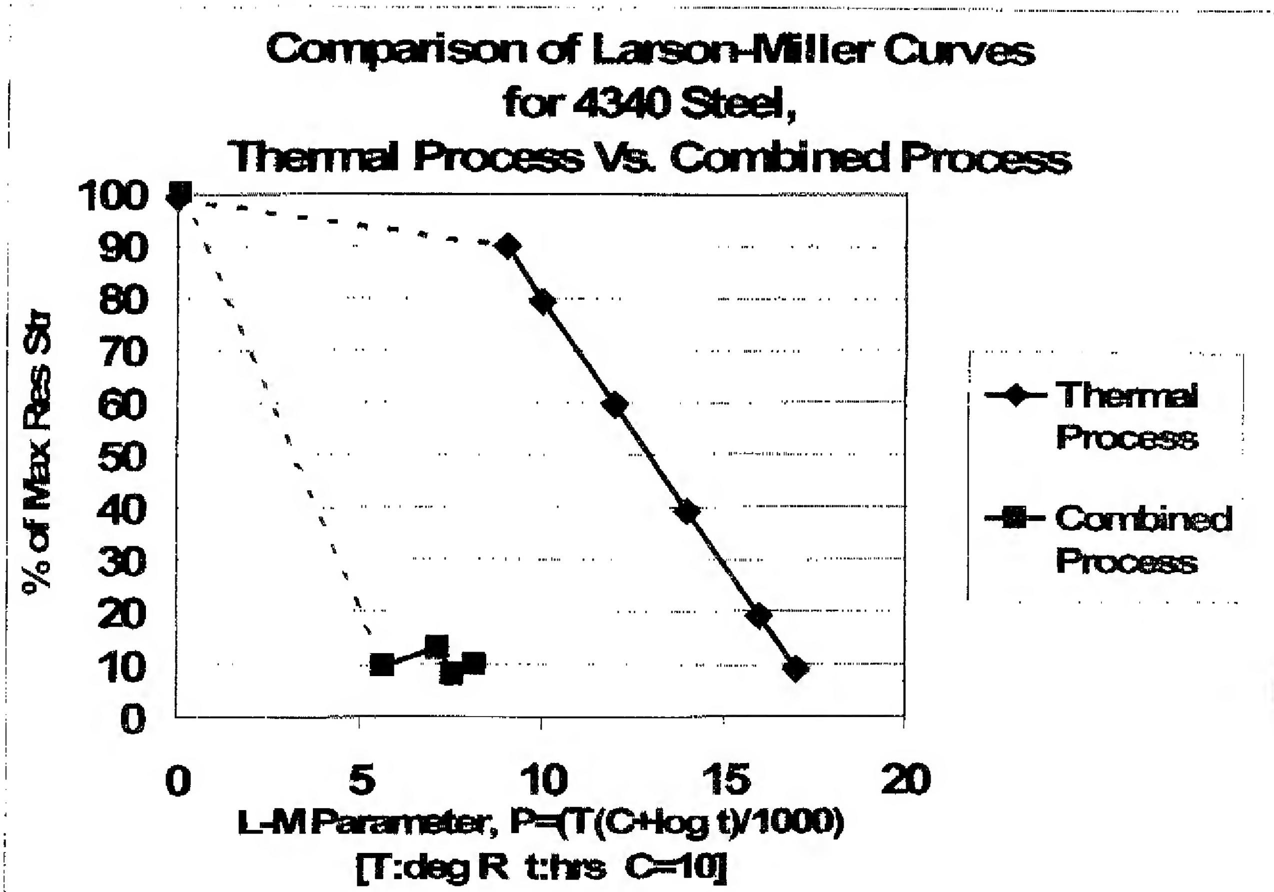
Full name of inventor:	Donna M. Walker
Inventor's Signature:	Donna M. Walker
Date:	April 3, 2006
Country of Citizenship:	U.S.
Residence:	40388 Ladene Lane Novi, Michigan 48375

EXHIBIT C



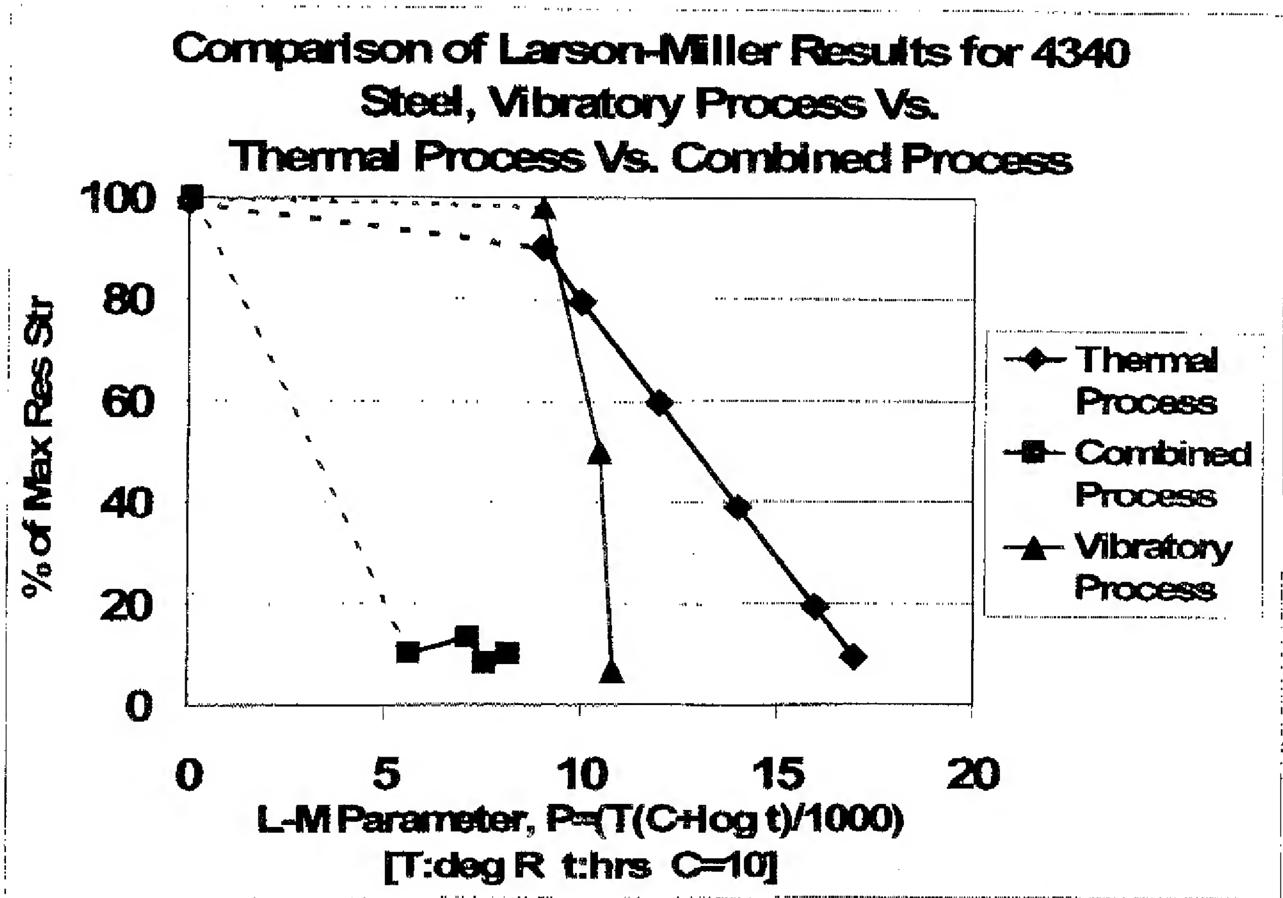
Plot 1: Use of Vibratory process only to stress relieve parts

EXHIBIT D



Plot 2: Use of Thermal Process plotted against use of Combined Process

EXHIBIT E



Plot 3: Use of Vibratory Process plotted against the Combined Process and the Thermal Process